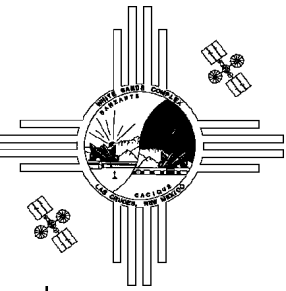# STS-111 Channel -2
1024 kbps Anomaly

Problem Description

- **During STS-111, several anomalies were experienced during Channel-2 Ops Recorder Dumps**

- **WSC Data Quality Monitor (DQM) was either slow to lock or dropped lock**

  - **The IR indicated carrier and bit sync lock during the anomaly period**

  - **Problem would occur on both "A" and "B" chains**

- **Problem appeared to occur most frequently during playback direction changes (FWD to REV or vice versa) or track changes**

  - **JSC also reported occurrences where no direction/track change involved**

- **Anomaly observed with the following configurations:**

  - **Both Ops recorders (many different tracks)**

  - **Four of five TDRS**

  - **PM Mode with Ch-3 modulation On and Off**

  - **FM Mode**
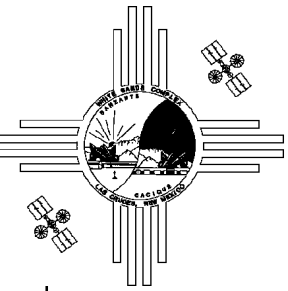
Problem Description

- **Problem reported by JSC on ~ 10 events**

  – **Problems on backup chain would not be noticed**

  – **Possible other occurrences were not reported**

- **Problem was only observed with Ops Recorder dumps**

- **JSC reported no problems with channel- 2 OCA at 2 Mbps in FM or PM mode**

- **Problem not observed during previous STS-110 mission**

  – **Channel-2 dumps utilized solid state recorder (MMU)**

- **No impacts reported by JSC to mission success**

  – **Ops Recorder dumps available through ground sites.**

 – **Tape was re-queued and dumped through TDRSS successfully**
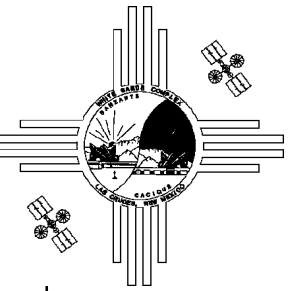
On-Orbit Testing with Modified IR Firmware

- **WSC Testing Orbits 107, 108 and 111 via TDS on 6/12/02**

  - **Modified firmware was installed in the backup chain on SGLT-3 IR to evaluate anomaly at WSC**

    - **One chain with mission firmware, one with modified, both processing Shuttle signal**

      - **Realtime data from WSC to JSC was from IR running mission firmware**

    - **Symbol sync configuration parameters were hypothesized as cause of slow lock**

    - **Results inconclusive, problem did not occur on these passes even with numerous track changes and tape reversals.**

   - **System restored to normal configuration after Orbit 111**
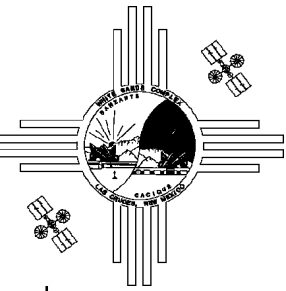
SN Operational Readiness Test

- **Operational Readiness conducted with ESTL on September 13, 2002**

  – **Objective was to duplicate the channel-2 dump anomaly experienced during STS-111**

  – **ESTL utilized an Ops recorder obtained from the SAIL to support channel-2 operations**

  – **Multiple attempts using several scenarios were tested**

    – **Tape Reversals, Track Changes, Tape Stop/Start, Channel-3 Mod On/Off, channel-2 with .1% jitter, 1024/960 kbps, antenna offpoints, KSA-1/2**

- **Testing was unable to reproduce the anomaly**
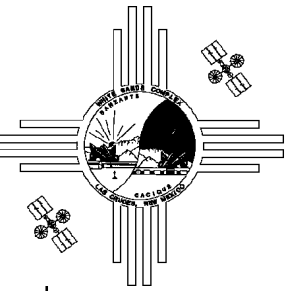
Summary

- **Problem did not occur during STS-111 premission testing using the JSC ESTL**

  - **ESTL used a data generator instead of Ops Recorder**

- **Problem did not occur during previous missions**

  - **STS-110 using PM mode and MMU for Ops Recorder**

    - **Majority of missions prior to STS-110 supported in FM mode**

- **Post STS-111 Mission Testing (STS-107 ORT) failed to reproduce the anomaly**

- **Problem may be specific to Ch-2 and current ops recorders**

  - **During STS-111 problem not seen with other Ch-2 data interfaces**

  - **Reasonable to believe problem will only occur with Ops Recorder dumps on Ch-2 and unlikely with other, more stable signal/data interfaces on Ch-2**

  - **STS-107 is the last OV-102 mission planned with old ops recorders. There are a number of OV-105 missions remaining before MMU upgrade.**
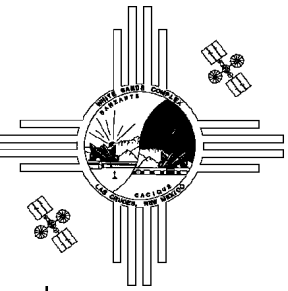
Discussion of Forward Work

- **Work with JSC to improve realtime reporting of problem so that better statistics and problem descriptions can be accumulated.**

- **Consider using ESTL during the next mission if problem occurs for comparison.**

- **If problem appears isolated to only occasional missions using old recorders, further work to identify and correct a problem may not be warranted since Ops Recorder data can be provided via GN or replay using TDRSS.**

  - **If an STS-107 payload is planning to use a tape recorder with a potentially high variance in clock rate, then explore potential of GN contingency payload dumps via FM Subsystem**

- **WSC Engineering will have various test equipment configured to evaluate signal received from orbiter**

  - **WSC may request installation of Integrated Receiver test firmware**